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A COMPARISON OF METHODS OF TIMBER
ESTIMATING

A Report

Presented to the Faculty of the Graduate School
Cornell University

For the Degree
of
Master in Forestry

by

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A COMPARISON OF METHODS OF TIMBER ESTIMATING

Methods applied:

Two woodlots, the "Slim Jim" and "Meads", have been estimated during the course of study, and four methods were used on each plot. They are:

1) Narrow Strip Method:

The instruments used in this method are one pair of calipers, one staff compass, one 66-foot chain and a note-book to tabulate the results. Two men form a working crew. The compass is first set at the corner of the woodlot and the direction obtained by loosening the compass screw and reading the bearing. Following the direction, the crew measures two or three chains ahead, the number depending upon the regularity of the stand. In a more regular and even-aged stand, as in Meads Woodlot, one strip for every three chains is measured while in an irregular and uneven-aged stand such as the Slim Jim, one strip for every two chains is necessary. After the crew has measured two chains parallel to the edge of the woodlot, the compass is set and turned at right angles to the original bearing into the woods. One chain is measured ahead, the caliper-man holding the head end of the chain and the note-keeper the rear end. The latter also attends to the setting and reading of the compass bearing. The caliper-man then measures the d.b.h. of every tree above 6" thirty-three feet on either side of the chain. The note-keeper tabulates the results by the "lot-system"

and also records the number of chains measured.

When the other end of the woodlot is reached, the note-keeper sets the compass and turns it until it reads the original bearing. Two or three chains more are measured ahead where the compass is again set and turned at right angles into the woods (180 degrees to the first turn). Then one chain after another is measured ahead and the d.b.h. of the trees recorded until the other end of the woodlot is reached.

This process is repeated until all the trees above 6" on the strips have been measured. A strip 10 chains long and 1 chain wide is equivalent to an acre; therefore, if a stand has 5 strips, each strip being 5 chains long and one strip for every two chains, the total area of the stand would be 5 acres.

2) The Broad-Strip Method:

This method is practically the same as the narrow strip method except that, instead of measuring one strip in every two or three chains, four or five chains are taken.

3) Circular Quarter-Acre Method:

Select any section which is representative of the stand, and with the note-keeper standing in the centre, the caliper-man measures every tree above 6" within a radius of 59 feet. The number of these sample plots required depends upon the size and regularity of the stand. In estimating the Meads and Slim Jim Woodlots, three sample plots were taken on each plot, and by averaging the volume of the timber found on these circular plots, an average volume for the plot (one-fourth of an acre) is obtained.

4) Tree-to-tree-count Method:

This is the accurate method. Every tree above 6" is measured. For every tree calipered, a chalk-mark is made at right angles to the direction in which the crew is proceeding.

Computation of the Volume of the stand:

After the stands have been measured, the results are put down in a tabulated form and the volume of the stand estimated by applying volume tables. In this study, the volume of white pine in board feet is obtained by applying the "Volume Table for Trees Near Ithaca" (Based on tables in bulletins 96, 36 and others, with values for appropriate heights from height curve. Data by class in Forestry 11), while the volumes of white oak, red oak, and "miscellaneous" composed of all the trees other than the three specified, are estimated in cubic feet, and the "Cubic Volume and Heights for Hardwoods--Cornell University Woodlots" constructed by B. H. Paul is used in its application. Site 3 is used.

The sum total of the results in the white pine column is the volume of white pine in board feet for the whole stand. The same is true in white oak, red oak, and "miscellaneous", and the total of the three columns gives in cubic feet the volume of the stand for hardwoods and hemlock which is the only other conifer in the two woodlots measured (Tree-to-tree-count method). For the strip and circular-plot methods, the volume of the stand is obtained by dividing the total acreage of the woodlot by the area estimated, and multiplying the result by the total volume obtained.

Remarks:

The estimating of the Meads Woodlot by the narrow and broad strip methods was done in the fall of 1914. Five strips were measured in applying the narrow-strip method and three in the broad-strip method. The other two methods were done in the months of April and May 1916.

The estimating of the Slim Jim Woodlot was started during the Spring Recess of 1916 and finished in the middle of May. Eight strips were measured in the narrow-strip method and four in the broad-strip. The work was done while the process of cordwood-cutting was being carried on. But considering the facts that Slim Jim is more irregular and uneven-aged and that cutting was being carried on during the course of study, it is surprising to note that, as a whole, the comparative results in Slim Jim are more uniform than those obtained from Meads.

Relative accuracy of the four methods used:

The most accurate method is the "tree-to-tree-count", second, the narrow strip, third, the broad strip, and fourth the sample plot. In a small and uneven-aged stand such as Meads or Slim Jim, the only way of obtaining accurate results is by using the accurate method. In using the strip methods, it is apt to run into strips with only very few trees on them, as in the middle part of Slim Jim. In applying the sample plot method, there is a tendency to select, instead of the most representative, the denser portions of the stand, thereby greatly exaggerating the volume of the stand.

In conclusion, it can safely be said that, in a large, even-aged and open stand, the broad strip method is sufficiently accurate and sample plots may be taken to serve as a check to the results. In an irregular and uneven-aged stand, the narrow strip method should be used, but in estimating a small and uneven-aged stand, it is fair to say that the accurate method is the only one to be used in order to avoid exaggerating or under-estimating the volume of the stand.

NOTE: The broad strip method has been misinterpreted. Instead of measuring one strip in every 4 or 5 chains as described the width of the strips is larger than those in narrow-strip method.

Meads Woodlot

Combined Data Of The Four Methods

Volume Computed From Field Measurements

	White Pine (board feet)	White Oak (cu. ft.)	Red Oak (cu. ft.)	Miscal's (cu.ft.)
Broad Strip	17,875	5308	1076.3	1879.5
Narrow Strip	26,655	1288.9	1235.2	2860.6
Sample Plot	1,900	283.9	155.7	631.5
Accurate Method	65,395	4002.7	3604.7	5532.8

Total volume Of stand computed from field measurements

	White Pine (bd.ft.)	White Oak (cu.ft.)	Red Oak (cu.ft)	Miscel's (cu.ft.)
Broad Strip	79,375	2654.0	5381.5	9377.5
Narrow Strip	79,695	38667	3705.6	8581.8
Sample Plot	51,300	7665.3	4203.9	14350.5
Acc. Method	65,3954	4002.7	3604.7	5532.8

Volume per Acre

	White Pine (bd.ft.)	White Oak (cu.ft.)	Red Oak (cu.ft.)	Miscel's (cu.ft.)
Broad Strip	11,770	393.1	979.2	1392.2
Narrow Strip	11,807	592.9	547.5	1271.4
Sample Plot	7,600	1136.8	622.8	2126.0
Acc. Method	9,658	592.7	534.0	819.6

	Total volume of h'dw'ds in cu.ft.	Volume of h'dw'ds p per Acre in cu. ft.
Broad strip	17,433.0	2582.7
Narrow strip	16,104.1	2385.8
Sample plot	26219.7	3884.1
Acc. method	13140.2	1946.9

Note: Total area of Meads Woodlot-----6.75 acres
Average width of woodlot-----4.5 chains

Slim Jim Woodlot

Combined Data Of The Four Methods

Volume computed from field measurements

	White pine (bd.ft.)	White oak (cu.ft.)	Red oak (cu.ft.)	Miscel's (cu.ft.)
Broad strip	7540	713.3	1148.0	14140.8
Narrow strip	13975	1943.1	2657.1	3190.1
Sample plot	1295	185.2	323.9	415.8
Accurate method	27025	2990.5	4978.3	7414.9

Total volume of stand computed from field measurements

	White pine (bd.ft.)	White oak (cu.ft.)	Red oak (cu.ft.)	Miscel's. (cu.ft.)
Broad strip	31668	2995.8	4821.6	5925.3
Narrow strip	29347	4080.5	5579.9	6699.2
Sample plot	26547	37966	6639.9	8523.9
Acc. method	27025	2990.5	4978.3	7414.9

Volume per Acre

	White pine (bd.ft.)	White oak (cu.ft.,)	Red oak (cu.ft.)	Miscel's. (cu.ft.)
Broad strip	6193	585.1	941.7	1155.3
Narrow strip	5732	796.9	1089.9	1308.4
Sample plot	5185	741.5	1296.9	1664.8
Acc. method	5278	584.1	972.1	1448.2

	Total volume of h'dw'ds in cu. ft.	Volume of h'dw'ds per acre in cu.ft.
Broad strip	13742.7	2684.1
Narrow strip	16359.6	3195.4
Sample plot	18960.4	3703.2
Acc. method	15383.7	3004.6

Note: Total area of Slim Jim-----5.12 acres
 Average width of woodlot-----3 chains